normal; the greatest monthly amount, 4.77, occurred at Laluz, and the least, 0.17, at Lordsburg.—*R. M. Hardinge.*

New York.—The mean temperature was 70.3°, or 2.5° above normal; the highest was 94°, at Brentwood on the 8th, and at Penn Yan, Waverly, Wedgewood, and Willets Point on the 31st; the lowest was 35°, at New Lisbon, and South Kortright on the 28th. The average precipitation was 6.07, or 2.34 above normal; the greatest monthly amount, 13.79, occurred at Littlefalls, and the least, 2.10, at Appleton—*R. G. Allen.*

North Carolina.—The mean temperature was 77.2°, or about 1.5° above normal; the highest was 98°, at Sloan on the 1st, and the lowest, 52°, at Linville on the 5th. The average precipitation was 7.94, or 2.16 above normal; the greatest monthly amount, 16.93, occurred at Horse Cove, and the least, 3.12, at Kittyhawk.— *C. F. von Herrmann.*

North Dakota.—The mean temperature was 65.4°, or 0.7° below normal; the highest was 104°, at Dickinson on the 15th, and at Medora on the 20th, and the lowest, 24°, at Fort Yates on the 12th. The average precipitation was 1.84, or 0.26 below normal; the greatest monthly amount, 4.05, occurred at Wahpeton, and the least, trace, at Glenullin and Medora.—*B. H. Bronson.*

Ohio.—The mean temperature was 73.5°, or 2.2° above normal; the highest was 100°, at Seaman on the 31st, and the lowest, 40°, at Bement on the 28th. The average precipitation was 4.50, or 1.65 above normal; the greatest monthly amount, 9.06, occurred at Clarksville, and the least, 1.38, at Montpelier.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 78.9°; the highest was 107°, at Kemp on the 22d, and the lowest, 52°, at Anadarko on the 13th. The average precipitation was 3.26; the greatest monthly amount, 8.97, occurred at Newkirk, while none fell at Beaver.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 68.2°, or 2.3° above normal; the highest was 119°, at Pendleton on the 10th, and the lowest, 30°, at Prineville on the 30th. The average precipitation was 0.36, or 0.01 below normal; the greatest monthly amount, 1.94, occurred at Ashland, and the least, trace, at several stations.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 72.3°, or 2.8° above normal; the highest was 99°, at Derry Station on the 8th, and the lowest, 37°, at Dushore on the 20th. The average precipitation was 6.60, or 2.45 above normal; the greatest monthly amount, 11.32, occurred at Girardville, and the least, 3.72, at Scranton.—*T. F. Townsend.*

South Carolina.—The mean temperature was 78.7°, or about normal; the highest was 99°, at Batesburg on the 25th, and the lowest, 57°, at Clemson College on the 4th. The average precipitation was 9.81, or 3.68 above normal; the greatest monthly amount, 24.68, occurred at Port Royal, and the least, 4.28, at Gaffney.—*J. W. Bauer.*

South Dakota.—The mean temperature was 71.0°, or about normal; the highest was 110°, at Shiloh on the 27th, and the lowest, 32°, at Rochford on the 24th. The average precipitation was 1.21, or 1.28 below normal; the greatest monthly amount, 3.00, occurred at Chandler, and the least, 0.05, at Spearfish.—*S. W. Glenn.*

Tennessee.—The mean temperature was 76.9°, or slightly above normal; the highest was 99°, at Savannah on the 24th, and the lowest, 50°, at Erasmus on the 29th. The average precipitation was 4.00, or slightly above normal; the greatest monthly amount, 8.32, occurred at Carthage, and the least, 0.83, at Chattanooga.—*H. C. Bate.*

Texas.—The mean temperature for the State during the month, determined by comparison of 36 stations distributed throughout the State, was 0.5° above the normal. There was a slight deficiency in temperature over west Texas and the east coast district. It was about normal over the western portion of the coast district and the panhandle, while there was a general excess over the other portions of the State, with the greatest, 3.4°, in the vicinity of Hearne. The highest was 106°, at Rhineland on the 18th, and the lowest, 49°, at Midland on the 15th. The average precipitation for the State, during the month, determined by comparison of 38 stations distributed throughout the State, was 0.18 below the normal. There was a slight deficiency over west, central, and southwest Texas, and it ranged from 1.07 to 2.63 below normal over the west coast district. The precipitation was generally above the normal over other portions of the State, with the greatest excess over north Texas, where it ranged from 1.28 to 3.18, with the greatest in the vicinity of Gainesville. The greatest monthly amount, 7.77, occurred at Brazoria, and the least, trace, at Corpus Christi and Point Isabel.—*I. M. Cline.*

Utah.—The mean temperature was 73.5°, or about 3.0° above normal; the highest was 110°, at St. George on the 11th, and the lowest, 26°, at the same station on the 4th. The average precipitation was 0.60, or slightly below normal; the greatest monthly amount, 1.50, occurred at Pareah, and the least, trace, at Promontory—*J. H. Smith.*

Virginia.—The mean temperature was 76.2°, or about 2.0° above normal; the highest was 99°, at Doswell on the 1st, and the lowest, 51°, at Burkes Garden on the 27th, 28th, and 30th. The average precipitation was 5.48, or 1.89 above normal; the greatest monthly amount, 10.61, occurred at Charlottesville, and the least, 1.25, at Tobaccoville.—*E. A. Evans.*

Washington.—The mean temperature was 68.0°, or 2.7° above normal; the highest was 115°, at Kennewick on the 10th, and the lowest, 37°, at Blaine on the 15th. The average precipitation was 0.48, or slightly below normal; the greatest monthly amount, 1.43, occurred at Fort Spokane, and the least, 0.01, at Lyle.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 73.7°; the highest was 96°, at Bluefield on the 24th, and the lowest, 44°, at Morgantown and Oldfields on the 28th. The average precipitation was 7.51, or about 3.50 above normal; the greatest monthly amount, 11.57, occurred at Philippi, and the least, 4.40, at Green Sulphur Springs.—*C. M. Strong.*

Wisconsin.—The mean temperature was 67.3°, or nearly normal; the highest was 99°, at Spooner on the 31st, and the lowest, 30°, at North Crandon on the 27th. The average precipitation was 3.20, or 0.58 above normal; the greatest monthly amount, 6.02, occurred at Whitemound, and the least, 0.23, at Eau Claire.— *W. M. Wilson.*

Wyoming.—The mean temperature was 67.9°, or 1.3° above normal; the highest was 105°, at Bittercreek on the 10th, and the lowest, 32°, at the same station on the 25th. The average precipitation was 0.82, or 0.07 below normal; the greatest monthly amount, 2.05, occurred at Fort Yellowstone, and the least, trace, at Otto.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

HANN'S HANDBOOK OF CLIMATOLOGY.

By Prof. M. W. HARRINGTON.

The second edition of this handbook of climatology bears evidence of the well-known industry and care of its learned author. Reductions of the extensive observations of others are given in very condensed form, requiring many hours for their preparation, and the book is filled with similar evidences of painstaking condensation from all sources. There is no evidence of a reduction of Professor Hann's activity, though past middle life, for this edition is fully one-half larger than the first edition, issued fifteen years ago.

It is about ten years since the Atlas of Meteorology was contributed by the same author as a part of the new edition of Berghaus' great Physical Atlas. A keen judgment of both the consistency of climatology and the accuracy of this book can be made by comparing the graphic delineations of ten years ago with the printed statements in the book. On trying it for a certain tropical island of great interest just now to the United States, it was found that the consistency of the two was great, though not absolute. It was near enough to show that our knowledge of the climate of the earth has been already worked out into a systematic web of woof and warp, where only the finer details are to be filled in hereafter. Yet it remains true that there are large parts of the earth's surface where an increase in our knowledge is much needed. Doctor Hann laments especially the scantiness of observations over the greater part of South America. Though the continent is covered by a series of civilized states, yet only southern Brazil, Argentina, and Chile have a regular system of observations, while elsewhere we must depend on the statements of travelers and an occasional series of observations by immigrants of scientific tastes. According to the author, Africa is better covered by the observed facts of climate than is the most of South America. The information from central Africa is, however, still scanty, as is that from the eastern Sahara and the eastern horn of the continent. In Asia our sources of information are more abundant, but observations from Thibet and interior China are yet very meager.

In the West Indies the information is much more complete, and Jamaica is as well known climatologically as most of the States of the Union. Many of the other islands have each a station with a series of years of observations behind it. Hawaii has long had systematic meteorological observers, and since 1890 has had its own weather bureau, under the surveyor general. In the Philippines we have yet only the

regular observations at Manila and a few scattered series due to Karl Semper thirty or forty years ago.

The handbook consists of three volumes, aggregating nearly 1,400 pages. The first volume is introductory, and relates to the elements of climate most worthy of observation and reduction, and to the different leading forms of climate, such as land climate, sea climate, and alpine climate, and under each is discussed the particular problems of general character that relate to it. It is to be noted that the idea of monsoons and monsoonal influences are decidedly extended in this edition, and the impression produced in going over it is strong that the monsoonal exchange plays a more important part in explaining the general phenomena of rainfall outside the regions habitually traversed by general storms than has heretofore been taken for granted. The second volume is devoted to tropical climate, and the third to that of the temperate and polar zones. The work of American meteorologists is copiously used, and in an appreciative way, and Dr. Hann always has a good word to say for the lonely settler of scientific tastes in the less frequented parts of the world who has the courage and industry to devote his leisure time to adding his contribution to the settlement of these world-wide problems. The entire work is a thorough, painstaking, and well digested compendium of what is known about the climates of the world, and there is no other book on the subject to compare with it. It is to be hoped that the amiable and learned author will live to issue several more editions of the work.

THE EFFECT OF APPROACHING STORMS UPON SONG BIRDS.

By CHARLES E. LINNEY, Section Director (dated September 12, 1898).

During the night of the 15–16th of August, 1898, very severe electrical, wind, and rain storms prevailed over the northern district of Illinois, reaching their greatest severity in Henry, Knox, Stark, and Bureau counties. The edges of the storm, however, spread eastward to Lake Michigan, northward to Wisconsin, and southward to Warren, Peoria, and Woodford counties.

A large number of my crop correspondents and voluntary observers commented on the extreme severity of the storm, the large amount of water which fell (in many cases exceeding 5 inches), and the heavy, constant, and near display of thunder and lightning. Among the card comments received was one from Mr. W. W. Warner, of Warner, Henry County, Ill., a station which was right in the midst of the most severe portion of the storm area. Mr. Warner said:

> Five and one-half inches of rain fell during eight hours of Monday night (15th) last. * * * It was a great electrical storm. * * * We have lots of birds, wild singers; for forty-eight hours before the great electrical storm not a sound was heard from our wild birds.

This statement in regard to the effect of the approaching storm upon the wild song birds was so full of interest that I wrote to Mr. Warner for additional information, supplementing it by a letter of inquiry to about twenty-five other reporters and observers scattered throughout the area covered by the storms.

Mr. Warner's reply to my letter requesting particulars contains the following:

> Replying to your favor of the 24th instant, in regard to the effect of storms on birds, I would say that I am the owner of some 1,200 acres here on which I allow no hunting; consequently I have lots of birds, friendly wild birds. My house is in a park of about 50 acres of mostly natural growth trees.
>
> The birds commence singing about daylight; several of the scarlet tanagers, which are quite tame, usually lead, and I think in no place in this climate have I heard so many and so great a variety of song birds as here, more in the morning, but usually continuing during most of the day.
>
> I have been in monsoons, hurricanes, etc., but the storm of the 15–16th, I think, exceeded anything I ever saw in the heavy and continuous thunder and vivid flashes of lightning. It lasted nearly eight hours, and some rain gauges showed 6.0 to 6.5 inches of rain.
>
> The day previous to the storm it was very still, with hot air, and I remarked to several: "Have you heard any birds?" etc. "Are we going to have a big storm or an earthquake?"
>
> I have traveled over 200,000 miles, looking over this planet, and on several occasions have observed the wild birds being silent before storms—electrical storms—and before earthquakes, volcanic eruptions, etc.
>
> In the first part of May, 1893, I was in Ceylon. Birds were numerous and noisy. One hot, still day the birds were all quiet. I inquired of my guide, "Where are the birds to-day?" He shook his head and said, "Big storm come." Next night the storm came; a deluge, with heavy and continuous thunder and lightning; killed two Cingalese and the horse they drove, a few feet from me.
>
> In March, 1886, I was on Mauna Kilauea, the volcano, and I noticed the birds did not sing. On the night of the 4–5th there were forty-three earthquake shocks felt, the bed of the crater broke down, etc.
>
> In June, 1893, I was over the same mountain, and the birds were numerous, happy, and noisy, and no unusual storms occurred, nor were there eruptions of the volcano.
>
> I might name other instances, but I might weary. I am sure, however, that in some things our wild birds know more than we.

From the many replies received to my letter of inquiry the following extracts may be interesting.

Prof. F. U. White, voluntary observer, Galva, Henry County, says:

> I have often noted that birds became silent upon the near approach of a storm, or gave desultory notes and went into hiding, especially before our afternoon thunderstorms when the sky became suddenly overcast and dark, with premonitory gusts, and even in the calm preceding these. I have never known nor before heard of animals being affected so far in advance of a storm as Mr. Warner gives in his note.

Mr. T. W. Stoner, crop reporter, Henry, Marshall County, says:

> I have been a close observer of the birds. Yes, they seek a safe place and keep perfectly quiet just before a storm, but I don't think they do as long a time before as Mr. Warner says. The brown thrush, robin, quail, and meadow lark will perch on some object off the ground, as the fence or tree, and sing for a long time occasionally before a rain. In fact many consider them something of a barometer. It appears that they have an instinct or knowledge of an approaching storm, and after it is over their songs and rejoicings are delightful. I am a warm friend of the birds.

Mr. C. N. Butt, voluntary observer, Knoxville, Knox County, says:

> I did not notice any change in the song of the birds at the time you speak of, but I have frequently noticed swallows and other birds, especially whip-poor-wills, in the afternoon when cloudy or threatening weather came before a rain, flying high in the air. I supposed they were catching gnats or flies for food.

Dr. Frederick A. Powell, voluntary observer, Henry, Marshall County, says:

> Many people to whom I have spoken about your letter of inquiry tell me that they often notice a restless movement among birds before a severe storm.

Mr. W. I. Greeley, voluntary observer, Tiskilwa, Bureau County, says:

> I did not notice any difference on the 15th, but have always considered it a sign of rain when robins sang on tops of trees. I have made inquiries; one farmer said he was going to thrash on the 16th, but he thought it looked very much like rain on the night of the 15th. He had pea fowls which always made a good deal of noise before a rain and they were quiet, he noticed it and thought it peculiar.

Mr. Wm. Marriott, crop reporter, LaMoille, Bureau County, says:

> I will here mention one or two things we noticed and my family spoke of. One was the screeching of the pea fowls; they kept up quite a racket on the day and evening before the storm. My wife spoke of it to me.

Mr. John A. Ettinger, crop reporter, Adeline, Ogle County, says:

> Robins, while in their season here, give warning of rainstorms by their unusually loud and persistent singing.

Mr. E. Stevens, crop reporter, Lena, Stephenson County, says: